



Level Transmitter

NRGT 26-2n

EN
English

Original Installation &
Operating Manual

850879-01

Contents

Content of this Manual	4
Scope of delivery/Product package	4
How to use this Manual	5
Illustrations and symbols used	5
Hazard symbols in this Manual	5
Types of warning	6
Specialist terms / Abbreviations	7
Usage for the intended purpose	8
Improper use	9
Basic safety information	10
Required personnel qualifications	11
Notes on product liability	11
Check the current output regularly	11
Function	12
Technical data	14
Example name plate/identification of the NRGT 26-2n	17
Factory settings	18
Overall view of the NRGT 26-2n	19
Dimensions of the NRGT 26-2n	20
Preparing for installation	21
Installation	22
Installing the NRGT 26-2n.....	23
Sealing surface dimensions of the NRG 26-2n.....	23
Example.....	23
Installing two level electrodes in a flange	24
Installation	25
Installing two level electrodes in a flange by detaching a terminal box.....	25
Installing two level electrodes in a flange by detaching a terminal box.....	26
Installation examples with dimensions for the NRGT 26-2n	27
Aligning the terminal box	32
Functional elements of the NRGT 26-2n	33
Electrical connection	34
Notes on electrical connection.....	34
Connecting the 24 V DC power supply.....	34
Connecting the actual value output (4-20 mA).....	34
Pin assignment of the M12 connector for non pre-wired control cables.....	34

Contents

Bringing into service	35
Changing the factory settings if necessary	35
Calibration to the lower limit of the active measuring range "CAL.L" (0% calibration value)	37
Perform independent rapid calibration at a water level of > 25% of the active measuring range "CAL.P"	38
Calibration to the upper limit of the active measuring range "CAL.H" (100% calibration value)	38
Setting the filter constant "Filt"	38
Manually initiating a display test	39
Checking the level display by raising or reducing the level	39
Checking function by initiating a test function	39
Starting, operation and testing	40
System malfunctions.....	43
Causes	43
Indication of system malfunctions using error codes	44
Common application and usage errors	46
Checking installation and function	48
Taking out of service	49
Cleaning the measuring electrode of the level transmitter	50
Cleaning interval	50
Disposal	50
Returning decontaminated equipment.....	50
Declaration of Conformity; Standards and Directives.....	51

Content of this Manual

Product:

- Level transmitter NRGT 26-2n

First edition:

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Scope of delivery/Product package

- 1 x level transmitter NRGT 26-2n
- 1 x sealing ring D 27 x 32, form D, DIN 7603-2.4068, bright annealed
- 1 x Installation & Operating Manual

Required accessories for NRGT 26-2n when installing for the first time

- 1 x cable jack, Phoenix Contact SACC-M12FS-5PL-SH

How to use this Manual

This Installation & Operating Manual describes the correct use of the NRG T 26-2n level transmitter. It applies to persons who integrate this equipment in control systems, install, bring into service, operate, maintain and dispose of this equipment. Anyone carrying out the above-mentioned activities must have read this Installation & Operating Manual and understood its contents.

- Read this Manual in full and follow all instructions.
- Please also read the instructions for use of any accessories.
- The Installation & Operating Manual is part of the product package. Keep it in an easily accessible location.

Availability of this Installation & Operating Manual

- Make sure this Installation & Operating Manual is always available to the operator.
- If you pass on or sell the equipment to a third party, please also hand over the Installation & Operating Manual.

Illustrations and symbols used

1. Action to be taken

2.

- Lists
 - ◆ Bullet points in lists

A Keys to illustrations



Additional
information



Read the relevant
Installation & Operating Manual

Hazard symbols in this Manual



Danger zone / Dangerous situation

Types of warning

DANGER

Warning of a dangerous situation that results in death or serious injury.

WARNING

Warning of a dangerous situation that may possibly result in death or serious injury.

CAUTION

Warning of a situation that may result in minor or moderate injury.

ATTENTION

Warning of a situation that results in damage to property or the environment.

Specialist terms / Abbreviations

Here, we explain some abbreviations, specialist terms, etc., which are used in this Manual.

NRGT .. / NRR.. / NRS.. / URS .. / URB .. / SRL .. / etc.

Equipment and type designations of GESTRA.

SELV

Safety Extra Low Voltage

Operating point (of the system)

The operating point describes the operating parameters within which a system or boiler is operated in its nominal range. In a pressurised steam boiler, for example, these parameters would be output, capacity, pressure and temperature.

The design data may be a lot more stringent, however.

A boiler that is operated at 10 bar and 180 °C may be designed for a pressure of 60 bar and a temperature of 275 °C, for example, which is not necessarily its operating point.

Usage for the intended purpose

Use as a water level controller

The NRGT 26-2n level transmitter can be used to continually measure the water level in steam boiler and hot-water installations, or in condensate and feedwater tanks. The calibrated measuring range from 0% to 100% makes up the linear profile of the 4-20 mA current output.

Influence of the fluid to be monitored

- The NRGT 26-2n level transmitter can be used in fluids with different conductivity and in insulating media. However, a conductivity of less than 100 $\mu\text{S}/\text{cm}$ has a major influence on the measured capacitance, which is why recalibration of the measuring range (see page 37) at the operating point* and after a cold start is extremely important.

** Operating point of the system, see page 7.*

- To achieve the best possible reproducibility and maintain high-quality measurements (see “Technical data” on page 14), the sensor must be installed in a protective tube (see “Installation examples with dimensions for the NRGT 26-2n” on page 27 ff).
- The dielectric constant of the measured medium may require an adjustment to the measurement frequency if it deviates significantly from that of the usual water ($\epsilon_r = 80$). Please contact GESTRA Service.

Usage for the intended purpose

Systems without SIL rating

In systems without a SIL rating, any controller, display unit or diagnostic tester with an input for a standard 4-20 mA signal can be connected.



To ensure proper use in all applications, please also read the Installation & Operating Manuals for the system components used.

- You can find the latest Installation & Operating Manuals for other system components on our website:

<http://www.gestra.com>

Improper use



There is a danger of death due to explosion if the equipment is used in potentially explosive atmospheres.

Do not use the equipment in potentially explosive atmospheres.



Do not bring any equipment into service that does not have its own specific name plate.

The name plate indicates the technical features of the equipment.

Basic safety information



Danger to life from scalding if the level electrode is removed under pressure. Steam or hot water can spurt forcefully out of the equipment.

- Only remove the level electrode at **0 bar boiler pressure**.



Risk of severe burns if work is performed on a level electrode that has not been allowed to cool. The level electrode becomes very hot during operation.

- Always allow the level electrode to cool.
- Perform all installation and maintenance work only on a level electrode that has been allowed to cool.



There is a risk of electric shock during work on electrical systems.

- Always switch off the voltage to the system before performing connection work.
- Check that the system is not carrying live voltage before commencing work.



Danger to life from a faulty NRG 26-2n level electrode due to the sudden escape of hot steam or hot water.

Shocks and impacts during transport or installation can result in damage to or leaks in the level electrode, causing pressurised hot steam or hot water to escape through the pressure relief hole.

- To prevent damage during transport and installation, do not expose the electrode rod to major shocks or impacts.
- Before and after installation, check that the level electrode is completely undamaged.
- Check that the level electrode is not leaking when bringing into service.



Attempts to repair the equipment will lead to non-availability of the system.

- The NRG 26-2n level electrode may only be repaired by the manufacturer, GESTRA.
- Only replace faulty equipment with identical equipment from GESTRA.

Required personnel qualifications

Activity	Personnel	
Integration in control system	Specialist staff	Plant designer
Installation/electrical connection/bringing into service	Specialist staff	The equipment may only be installed, wired and brought into service by qualified and competent staff.
Operation	Boiler service technician	Staff trained by the plant operator.
Maintenance work	Specialist staff	Maintenance and conversions may only be performed by authorised staff who have undergone specific training.
Refits	Specialist staff	Persons trained by the plant operator to work with pressure and temperature.

Fig. 1

Notes on product liability

The manufacturer cannot accept any liability for damages resulting from improper use of the equipment.

Check the current output regularly

Check level electrode function at least once a year by bringing the system to the minimum and/or maximum water level (T1 = 1 year).

The test function is initiated on site using the integrated rotary knob on the terminal box, see page 42.

Function

The NRG 26-2n level transmitter uses the capacitance measurement principle and converts level data into a level-dependent 4-20 mA current signal. The 0-100% measuring range can be scaled based on the effective length of the electrode rod.

Automatic self-test

An automatic self-test periodically monitors the safety and function of the level transmitter and measured value acquisition.

Faults in the electrical connection or electronic measuring equipment trigger a fault indication on the display, and the current output is set to 0 mA.

Transmitter function

The transmitter function is the ability of the electrode to provide a scalable measuring range on the 4-20 mA current output interface and to make this available to one or more recipients for analysis.

These transmitters do not have any controlling or limiting functions.

The level transmitter is installed on the inside of steam boilers, tanks or feed lines of hot-water installations. A protective tube (see "Installation examples" on page 27) provided on site keeps the transmitter functioning reliably.

A capacitance NRG 26-2n level transmitter and a conductivity NRG 1x-60 or NRG 1x-61 level electrode can be installed in the same protective tube or level pot.

Operation in external level pots

If a level transmitter is installed outside the boiler in a level pot that can be shut off, the connecting pipes must be flushed regularly.

If the steam pipe is ≥ 40 mm and the water pipe is ≥ 100 mm, installation is regarded as internal. In this case, upstream monitoring of flushing processes is not required.

Display and signals, see pages 40/43 *

The NRG 26-2n level transmitter features a green 4-digit, 7-segment display for showing readings, status information and error codes. A red and green LED indicate the operating status.

Function

Behaviour when switched on *

The display alternately shows the software version, the type and then the scaled level reading.

Behaviour in normal operation (no errors) *

The display shows the scaled level reading (3 digits + 1 decimal place), e.g. 050.3, and converts the level data into a level-dependent current signal from 4-20 mA.



The scale of the 0-100% measuring range is factory-set at a maximum for the electrode length used. This way, meaningful level readings can be obtained immediately after installation.

Adjusting the measuring range when bringing into service (CAL.L, CAL.P or CAL.H)

When bringing into service, however, the measuring range should be adapted in line with your sight glass. Do this using the parameters CAL.L, CAL.P or CAL.H, see pages 37 - 38. This is the only way to gain all the benefits of high-resolution readings in the sight glass range.

Behaviour in the event of malfunctions *

The error state or malfunction is permanently shown on the display by an error code, e.g. E.005. For more on error codes, see page 44.

Every time there is a fault, 0 mA is output via the current output.



Faults are displayed based on their priority. Indications with higher priority are shown continuously before those with low priority. If several indications need attention, the display does not alternate between them.



Electrode faults cannot be acknowledged.

When the fault is corrected, the message disappears from the display, and the NRG 26-2n level transmitter returns to normal operation.



* The tables on pages 41 - 42 clearly show the relationship between the equipment status, the display and the status LEDs.

Setting parameters and changing factory settings.

If necessary, you can adapt the electrode parameters to suit conditions at the plant. You can set parameters and change factory settings using a rotary knob on the terminal box, see page 36 ff.

Technical data

Model and mechanical connection

- NRGT 26-2n Thread G $\frac{3}{4}$ A, EN ISO 228-1, see Fig. 5

Nominal pressure rating, admissible service pressure and temperature

- NRGT 26-2n PN 40 32 bar (g) at 238 °C

Materials

- Terminal box 3.2581 G AISi12, powder-coated
- Cover tube 1.4301 X5 CrNi 18-10
- Electrode rod insulation PTFE
- Screw-in body 1.4571, X6CrNiMoTi17-12-2

Max. electrode length at 238 °C, all measurements in mm

- NRGT 26-2n

Max. electrode length:	373	477	583	688	794	899	1004
Measuring range:	300	400	500	600	700	800	900

Max. electrode length:	1110	1214	1319	1423	1528	1636	2156
Measuring range:	1000	1100	1200	1300	1400	1500	2000



Do **not shorten** the electrode rod.

Technical data

Measurement quality

The information below applies to a compensated fluid conductivity range from 100 – 10000 $\mu\text{S/cm}$ based on 25 °C.

- | | | |
|---------------------------------------|-----------------------------|---|
| ■ Reading error: | +/- 1% | from the set measuring range at the operating point |
| ■ Resolution of reading on display: | 0.1% | |
| ■ Resolution for internal processing: | 15 bits | with sign (16 bits) |
| ■ Resolution of 4-20 mA output: | 15 bits | equivalent to 0.49 $\mu\text{A/digit}$ |
| ■ Sensitivity (minimum conductivity) | | |
| ◆ Water | ≥ 0.5 $\mu\text{S/cm}$ | ("Influence of the fluid to be monitored") |

Supply voltage

- 24 V DC +/-20%

Power consumption

- Max. 7 W

Current input

- Max. 0.3 A

Internal fuse

- T2A (slow blow)

Safety cutout at excessive ambient temperature

- The cutout at excessive ambient temperature takes place at $T_{\text{amb.}} = 75$ °C

Analogue output

- 1 x actual value output 4-20 mA, proportional to level, galvanically isolated
- Maximum output load 500 Ω
- M12 connector, 5-pole, A-coded

Indicators and controls

- 1 x green 4-digit, 7-segment display for showing status information
- 1 x red LED for indicating an error state
- 1 x green LED for indicating an OK state
- 1 x rotary knob IP65 with button for menu navigation and test function

Protection class

- III Safety Extra Low Voltage (SELV)

IP rating to EN 60529

- IP 65

Technical data

Admissible ambient conditions

- Service temperature: 0 °C – 70 °C
- Storage temperature: -40 °C – 80 °C
- Transport temperature: -40 °C – 80 °C
- Air humidity: 10% – 95% non-condensing

Weight (dependent on length of electrode)

- NRGT 26-2n approx. 1.8 kg (with 300 mm measuring range)

Admissible installation positions

- Vertical
- Oblique to a maximum inclination of 45°. In this case, the length of the electrode rod is limited to 688 mm maximum.

Example name plate/identification of the NRG T 26-2n

Safety note →		Betriebsanleitung beachten! See installation instruction!	
Equipment designation →	NRGT 26-2n		
Equipment function →	Niveautransmitter Level Transmitter		
Nominal pressure rating, connection thread, material of screw-in body →	PN40 G3/4 1.4571	IP65	← IP rating
Admissible service pressure, admissible temperature →		32bar (464psi) 238°C (460°F)	
Admissible ambient temperature →		T _{amb} = 770°C (158°F)	
Measuring range →	24 V  ±20%	7W	← Power consumption ← Supply voltage
Actual value output →	H=300mm		
	OUT: 4-20mA/500Ω		
Current approval, conformity mark →	TUV.XXXX.XX-XXX		
			
			← Disposal information
Manufacturer →			← Protection class
Serial number →		 440353	

Fig. 2



The date of production is stamped on the screw-in body of the level transmitter.

Factory settings

The NRGT 26-2n level transmitter has the following factory settings:

Menu display	Parameter values	Unit	
CAL.L	variable	0%	Raw value (hex) approx. 50 mV
CAL.P	variable	25%	Raw value (hex)
CAL.H	variable	100%	Raw value (hex) approx. 2.0 V
FiLt	0005	seconds	

Fig. 3

Overall view of the NRG T 26-2n

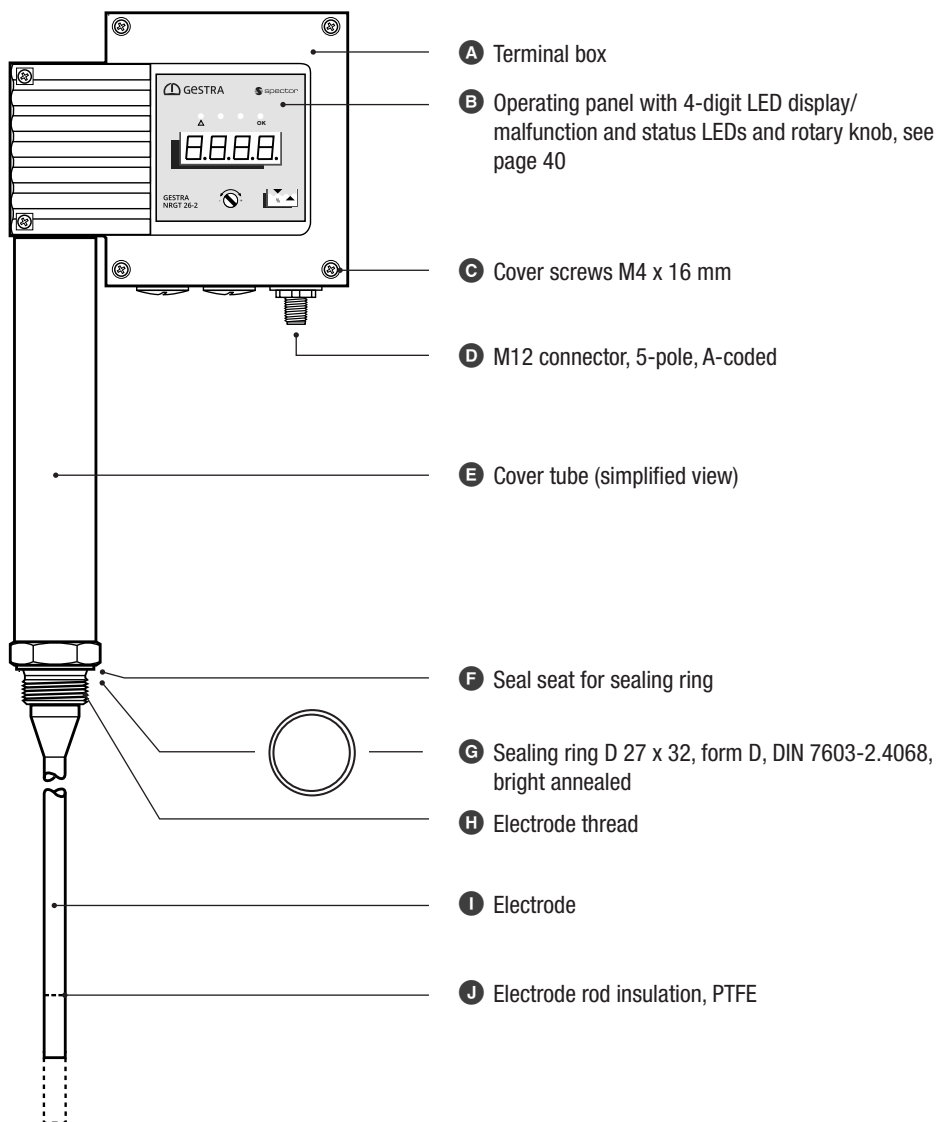


Fig. 4

Dimensions of the NRGT 26-2n

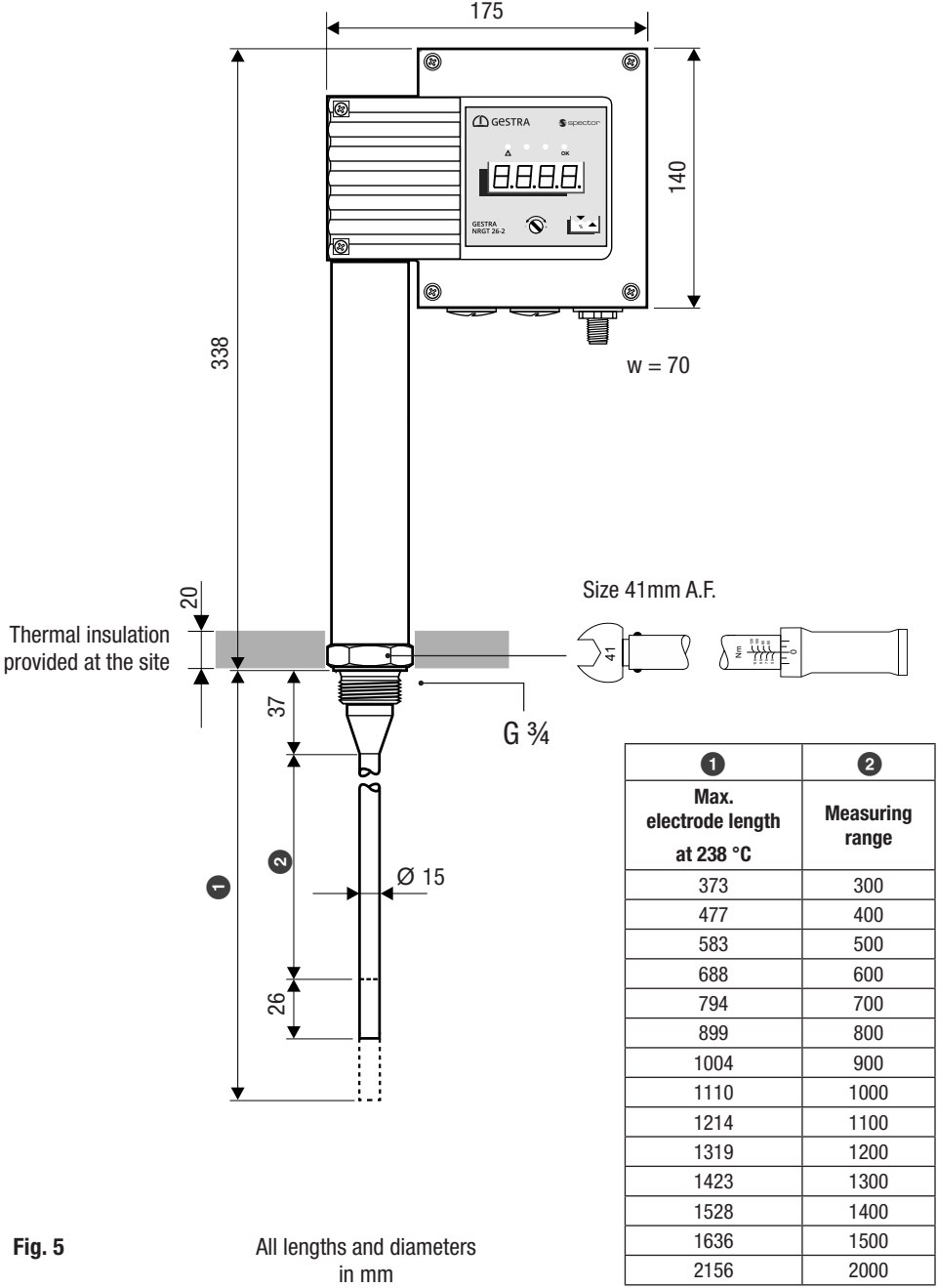


Fig. 5

All lengths and diameters in mm

Preparing for installation



If the equipment is to be installed outdoors, outside the protection of a building, environmental influences may adversely affect function.

- Pay attention to the admissible ambient conditions in the technical data, see page 16.
- Do not operate the equipment if the temperature is below freezing.
 - ◆ At temperatures below freezing, use a suitable heat source (e.g. control cabinet heater, etc.).
- Connect all parts of the system to a central earthing point to prevent equalisation currents.
- Use a cover to protect the equipment from direct sunlight, condensation and heavy rain.
- Use UV-resistant cable ducts for routing the connecting cable.
- Take further measures to protect the equipment from lightning, insects and animals, and salty air.

You will need the following tools:

NRGT 26-2n

- Torque wrench (with size 41 open-ended spanner attachment), see page 20.

Installation

DANGER



Danger to life from scalding caused by escaping hot steam.

Hot steam or water can escape suddenly if the level electrode is unscrewed under pressure.

- Reduce the boiler pressure to 0 bar and check the pressure before unscrewing the level electrode.
- Only remove the level electrode at a boiler pressure of 0 bar.

WARNING



The hot level electrode can cause severe burns.

The level electrode becomes very hot during operation.

- Always let the level electrode cool down before performing installation and maintenance work.
- Only remove level electrodes that have cooled down.

ATTENTION



Incorrect installation can lead to malfunctions in the system or the level electrode.

- Inspect the sealing surfaces of the tank standpipe or flange cover to ensure they are perfectly machined, see Fig. 6.
- Do not shorten the electrode rod.
- Take care not to bend the level electrode during installation!
- Do not subject the electrode rod to hard impacts.
- Do **not** install the terminal box **A** or upper part of the electrode cover tube **E** in the boiler thermal insulation!
- Pay attention to the minimum clearances when installing the level electrode, see installation examples in Fig. 9 to Fig. 13.
- To prevent current leaks, maintain a minimum distance of 14 mm between the electrode and earth (flange or tank wall).
- Check the boiler standpipe and flange during the preliminary boiler inspection.
- **For oblique installation of the NRG T 26-2n**
The level electrode must not be inclined more than 45° maximum, and the electrode rod is limited to 688 mm maximum, see Fig.15.

Installation

Installing the NRG 26-2n

1. Inspect the sealing surfaces of the tank stand-pipe or flange cover.

Sealing surfaces must be perfectly machined, as shown in Fig. 6.

Sealing surface dimensions of the NRG 26-2n

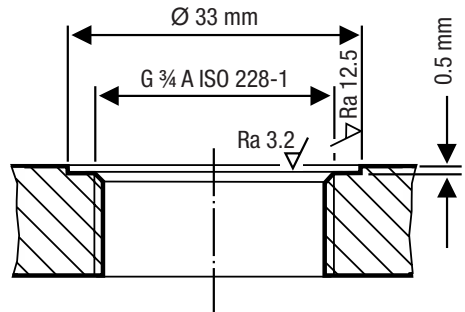


Fig. 6

2. Push the supplied sealing ring **G** onto the seal seat **F** of the electrode or lay it on the sealing surface of the flange.

DANGER



Danger to life from escaping hot steam if incorrect or defective seals are used.

- Only use the supplied sealing ring for sealing the electrode thread **H**.
- ◆ **Sealing ring D 27 x 32**
DIN 7603-2.4068, bright annealed

Prohibited seal materials:

- Hemp, PTFE tape
- Conductive pastes

Example

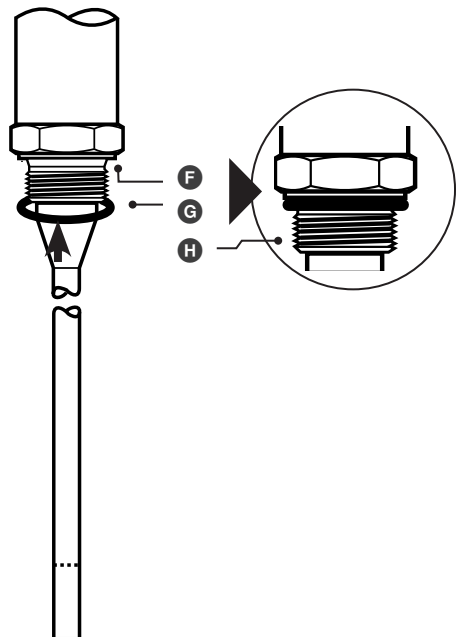


Fig. 7

Installation

3. If necessary, apply a small quantity of silicone grease (e.g. Molykote® III) to the electrode thread .
4. Screw the NRGT 26-2n level electrode into the tank standpipe or flange cover, and tighten securely using a torque wrench (with size 41 open-ended spanner attachment).

Tighten to the torques stated below.

Tightening torque when cold:

- NRGT 26-2n = 160 Nm

Installation example with dimensions, see Fig 9, page 27

Installing two level electrodes in a flange



A self-locking fixing nut connects the terminal box to the electrode. Before establishing the electrical connection, you can therefore rotate the terminal box max. $\pm 180^\circ$ (a half turn) in the desired direction. This is often sufficient for alignment.
If, and only if, this option is not sufficient, completely disconnect the terminal box from the electrode and mount it again later on, see the steps below.



ATTENTION



Incorrect installation can lead to malfunctions in the system or the level electrode.

The steps below must be carried out exclusively by the manufacturer's service personnel or a specialist expressly authorised by the manufacturer to perform this work.



Avoid open circuits or damaging terminals and a subsequent short circuit

- When screwing the level electrode into or out of the standpipe, take care not to twist or trap the connecting cables from the electrode to the terminal box!
- Therefore, detach all connecting cables from the electrode to the terminal box before unscrewing the level electrode from the standpipe.

Installation

Installing two level electrodes in a flange by detaching a terminal box

1. Fit the **first** electrode as described above.
2. Undo and remove the rear panel of the terminal box of the **second electrode** opposite the control panel.

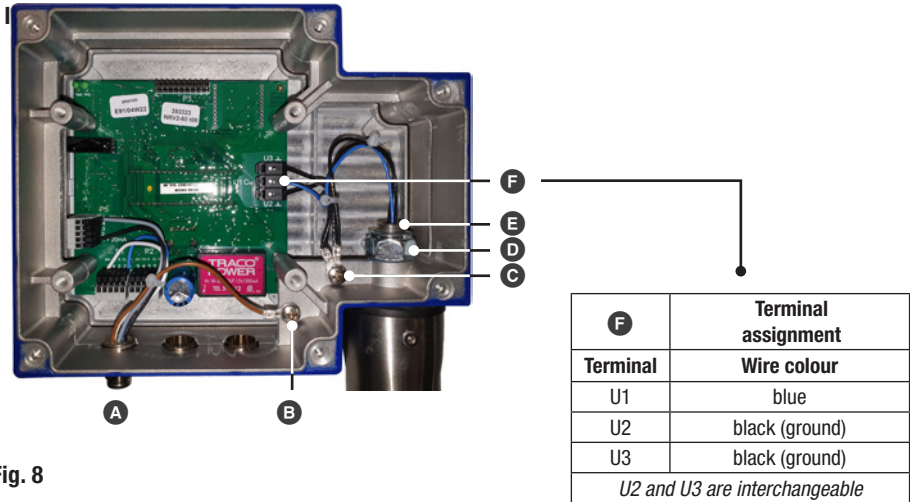


Fig. 8

Key:

- A** M12 connector
- B** Ring cable lug no. 2
- C** Ring cable lug no. 1
- D** Fixing nut (size 19), self-locking
- E** Cable gland for connecting cable to electrode
- F** Terminals
U1 (centre) / U2 (bottom) / U3 (top)

3. Detach the electrode connecting cables from the PCB:
 - Detach the ring cable lug **C**
 - Detach the connecting cables from the terminals **F**
4. Slacken the fixing nut **D** in the terminal box of the **second electrode** using a size 19 open-ended spanner.
5. You can now remove the terminal box or screw it onto the electrode.
When the terminal box is removed completely, all detached connecting cables must be routed through the detached fixing nut and the hole in the terminal box.
6. Install the **second electrode** in the flange.
7. Next, route all connecting cables through the hole in the terminal box and the fixing nut once again.

Installation

Installing two level electrodes in a flange by detaching a terminal box

8. Place the terminal box back on the electrode with the required orientation.



Ensure the terminal box is correctly orientated/aligned – position it correctly in advance.

9. Tighten the fixing nut in the terminal box to a torque of 25 Nm.

10. Reconnect the electrode wiring to the PCB, see table in **Fig 8**.

If necessary, join the connecting cables in the terminal box together using cable ties.

11. Finally, check the wiring one more time.

12. Close the rear panel of the second electrode terminal box and screw back on.

Installation examples with dimensions for the NRG 26-2n

Protective tube (provided on site) for internal installation

Illustration not to scale.

See the key on page 32

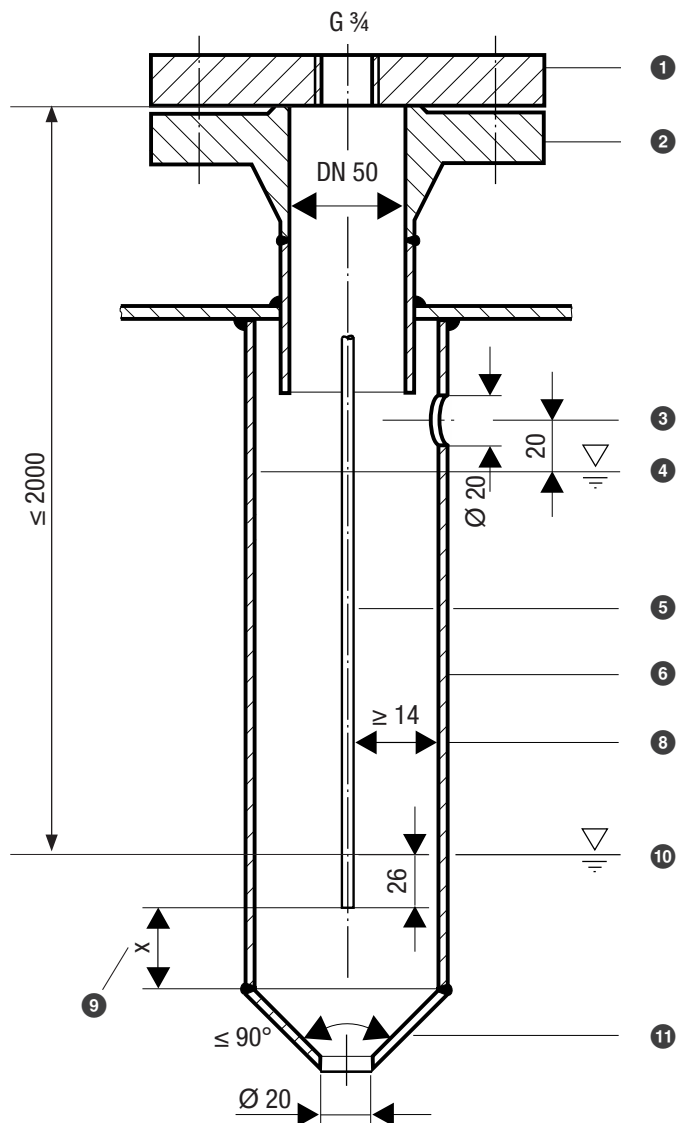


Fig. 9

All lengths and diameters in mm

Installation examples with dimensions for the NRG T 26-2n

Protective tube (provided at the site) for internal installation.

Illustration not to scale.

See the key on page 32

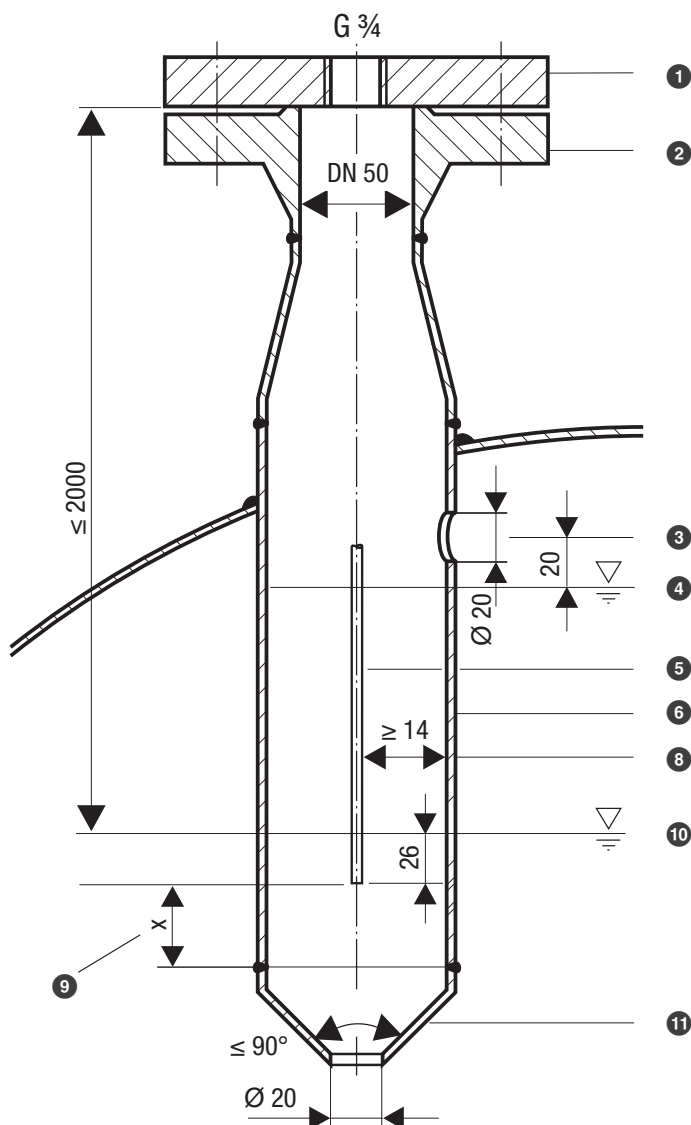


Fig. 10

All lengths and diameters in mm

Installation examples with dimensions for the NRG T 26-2n

Level pot ($\geq \text{DN } 80$) for external use.

Illustration not to scale.

See the key on page 32

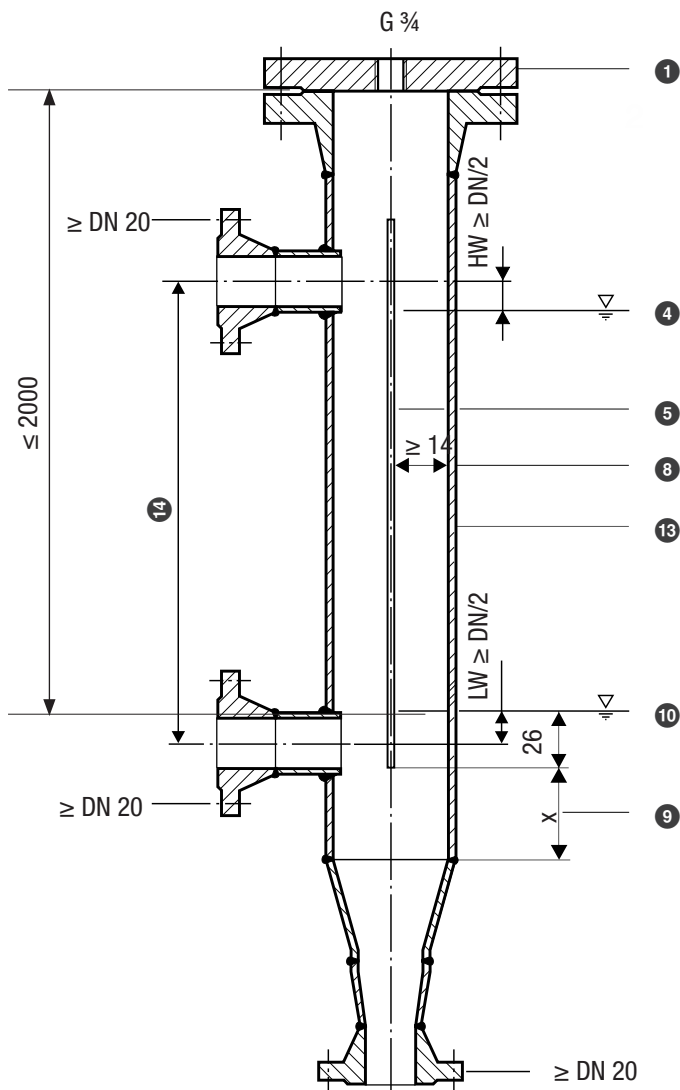


Fig. 12

All lengths and diameters in mm

Installation examples with dimensions for the NRG 26-2n

Oblique installation, e.g. in steam boilers.

The level electrode or level transmitter must not be installed at an inclination of more than 45° maximum, and the length of the electrode rod is then limited to 688 mm maximum (equivalent to measuring range H=600mm).

Illustration not to scale.

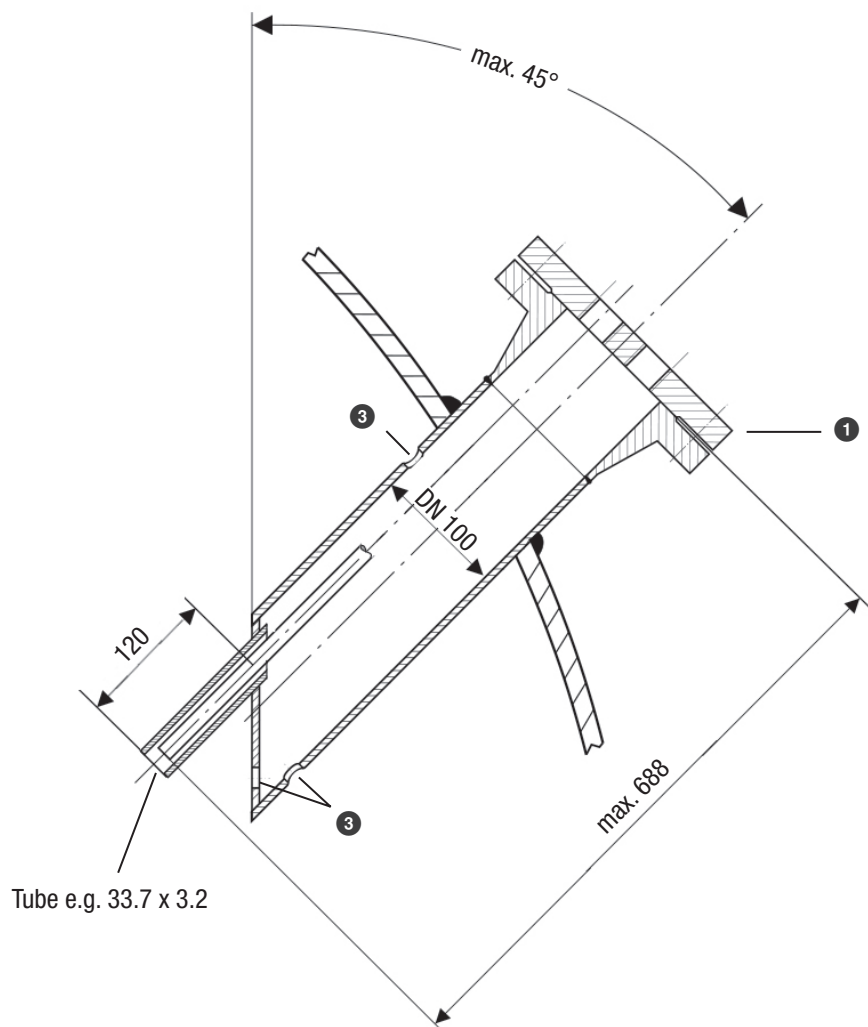


Fig. 13

All lengths and diameters in mm

Installation examples with dimensions for the NRG T 26-2n

Key, Fig. 9 to Fig. 12

- ① Fig. 9, 10: Flange (PN 40, DN 50) EN 1092-01 (single electrode)
Fig. 12: Flange (PN 40, $\geq$ DN 80) EN 1092-01 (single electrode)
Fig. 11, 13: Flange (PN 40, DN 100) EN 1092-01 (two electrodes installed in one flange)
- ② Standpipe for connecting flange (perform preliminary inspection of standpipe during boiler inspection)
- ③ Pressure relief hole $\varnothing$ 20 mm
- ④ Highest possible HW mark
- ⑤ Electrode rod (NRGT 26-2n maximum measuring range 2000 mm)
- ⑥ Protective tube DN 80 ($\geq$ DN 100 in France as per AFAQ)
- ⑦ Protective tube DN 100
- ⑧ Distance between electrode rod and protective tube $\geq$ 14 mm
- ⑨ Minimum dimension (x) = 10 mm below the maximum electrode length
(for electrode length, see page 20)
- ⑩ Lowest possible LW mark (end of measuring range)
- ⑪ Reducer EN 10253-2, K-88.9 x 3.2 - 42.4 x 2.6 W
- ⑫ Reducer EN 10253-2, K-114.3 x 3.6 - 48.3 x 2.9 W
- ⑬ Level pot $\geq$ DN 80
- ⑭ Centre distance of connection
- ⑮ Additional electrode

Aligning the terminal box

If necessary, you can orientate the display in the desired direction by rotating the terminal box.

ATTENTION



Rotating the terminal box $\geq 180^\circ$ will damage the internal wiring of the NRG T 26-2n level transmitter.

- Never rotate the terminal box more than 180 degrees in either direction.
-

Functional elements of the NRGT 26-2n

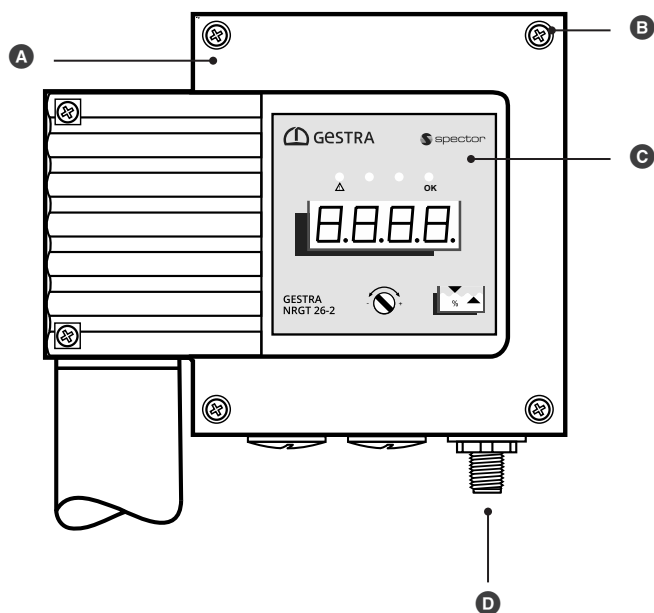


Fig. 14

Example
NRGT 26-2n

- A** Terminal box
- B** Cover screws M4 x 16 mm
- C** Operating panel with 4-digit LED display/malfunction and status LEDs and rotary knob, see page 40
- D** M12 connector, 5-pole, A-coded

Electrical connection

Notes on electrical connection

- Use a shielded, multi-core control cable with a minimum conductor size of 0.5 mm², e.g. LiYCY 4 x 0.5 mm².
- Pre-wired control cables (with plug and coupling) are available as accessories in various lengths.

Connecting the 24 V DC power supply

- The NRG 26-2n level transmitter is supplied with 24 V DC.
- A safety power supply unit that delivers a Safety Extra Low Voltage (SELV) and is isolated from connected loads must be used to supply the equipment with 24 V DC.

Connecting the actual value output (4-20 mA)

- Please note the maximum output load of 500 Ω .
- Maximum cable length = 100 m.

Pin assignment of the M12 connector for non pre-wired control cables

If non pre-wired control cables are used, you must wire the cable to match the pin assignment of the M12 connector.

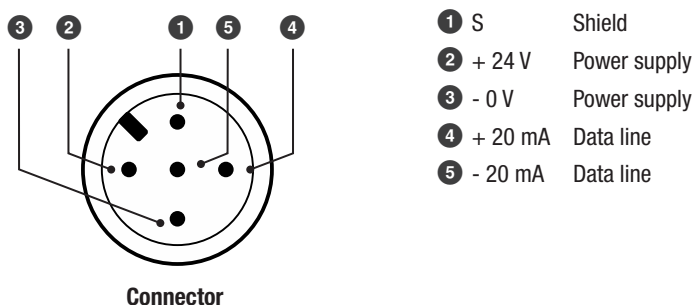


Fig. 15

Bringing into service

- Before bringing into service, check that the level transmitter is correctly connected.
- Next, switch on the supply voltage.

Changing the factory settings if necessary

You will need the following tools

- Slotted screwdriver, size 2.5

Notes for bringing into service for the first time



When bringing into service for the first time, the 0-100% scale of the measuring range is set ex-works at a maximum for the corresponding electrode length.

After installation, set the measuring range to effective, system-specific values.

Bringing into service

Selecting and setting a parameter:



Using the screwdriver, turn the rotary knob clockwise or anti-clockwise until the desired parameter appears on the display. The set value is displayed after approx. 3 seconds.

The display alternates between the set parameter and its actual value, e.g. Filt. → "value" → Filt.

The following parameters are shown one after the other when you turn the knob clockwise:

"Actual value" → °C.in → CAL.L → CAL.P → CAL.H → Filt → diSP
→
InFo → PW → "Actual value"

*** Key to parameters, see page 36.**



If you do not enter anything for 30 seconds, the display automatically returns to the actual value.



Once you have selected a parameter, press and hold the rotary knob until the current value of this parameter flashes on the display.



Set the desired value.

- / + reduce/increase the value

Each parameter has an individual, admissible value range.

By pressing the knob briefly, you can jump to the next digit. This is a more convenient way of making large changes to values.



If you do not set a parameter within 10 seconds, the process is aborted ("quit") and the old parameter value is retained.



Save your settings by pressing the rotary knob for approx. 1 second.

The message "donE" is shown and the parameter appears on the display once more.

Bringing into service

Key to parameters:

- 099.9 = actual value display, the current measured level based on the 0-100% calibration
- °C.in = display ambient temperature of terminal box
- CAL.L = lower limit calibration to 0%
- CAL.P = calibration of measuring range to an intermediate value above 25% (alternative to CAL.H)
- CAL.H = upper limit calibration to 100%
- Filt = filter constant
- diSP = initiate a display test

Notes on calibration



Always perform calibration with the boiler fluid at the operating point

If you set the measuring range while the fluid is cold, the settings will change on exposure to heat and will then need to be corrected at the operating point.

Calibration to the lower limit of the active measuring range “CAL.L” (0% calibration value)



Bring the level to 0% and perform calibration.

Pay attention to the setting instructions on page 36 and proceed as follows:

1. Reduce the level of water in the boiler to the 0% limit of the desired measuring range.
2. Select the parameter “**CAL.L**”. After approx. 3 seconds, the old value is shown in hexadecimal.
3. Press and hold the rotary knob until the new value is displayed.
4. Save your setting by pressing the rotary knob for approx. 1 second.
5. Continue with calibration “**CAL.P**” or “**CAL.H**”.

Bringing into service

Perform independent rapid calibration at a water level of > 25% of the active measuring range "CAL.P"



This parameter enables partial filling of the boiler, as an alternative to complete filling. The value set for partial filling is extrapolated to 100% of the boiler level.

Pay attention to the setting instructions on page 36 and proceed as follows:

1. Increase the level of water in the boiler to > 25% of the desired measuring range.
2. Select the parameter "**CAL.P**". After approx. 3 seconds, the old value is shown in hexadecimal.
3. Press and hold the rotary knob until the value (e.g. 0025) appears. The last digit flashes.
4. Set the desired reading to > 25% to match the set level.
5. Save your setting by pressing the rotary knob for approx. 1 second.

Calibration to the upper limit of the active measuring range "CAL.H" (100% calibration value)



Calibration with "CAL.H" ensures the best possible accuracy for setting the measuring range.

Pay attention to the setting instructions on page 36 and proceed as follows:

1. Raise the water level in the boiler to the 100% limit of the desired measuring range.
2. Select the parameter "**CAL.H**". After approx. 3 seconds, the old value is shown in hexadecimal.
3. Press and hold the rotary knob until the new value is displayed.
4. Save your setting by pressing the rotary knob for approx. 1 second.

Setting the filter constant "Filt"



Here, you can set a time constant to smooth the output signal for the level controller and the display.

Pay attention to the setting instructions on page 36 and proceed as follows:

1. Select the parameter "**Filt**". First of all, the current filter constant is displayed.
2. Press and hold the rotary knob until the current time constant flashes on the display.
3. Set the desired time constant (1 to 30 seconds).
4. Save your setting by pressing the rotary knob for approx. 1 second.

Bringing into service

Manually initiating a display test

Pay attention to the setting instructions on page 36 and proceed as follows:

1. Select the parameter "**diSP**".
2. Press and hold the rotary knob until the display test starts and shows "....".
3. The following numbers and decimal points run across the display from right to left:
"...., **1, 2, 3, 4, 5, 6, 7, 8, 9,**"
4. Check that all numbers and decimal points are displayed correctly.

The display test runs automatically until it has finished, and cannot be interrupted.

5. The display test ends with "**donE**".

Replacing faulty equipment



Faulty equipment is a risk to system availability.

- If numbers or decimal points are displayed incorrectly or not at all, you must replace the level transmitter with an identical one from GESTRA.
-

Checking the level display by raising or reducing the level



Incorrectly installed or bent level electrodes result in a loss of function that can jeopardise system availability.

Therefore, proceed as follows when bringing into service and when replacing level electrodes:

- Check the level display by raising and lowering the fluid to different levels within the measuring range of the level electrode. Always perform this check with the system at its operating point.
 - Never start up any system that has not passed the above tests.
 - The NRG 26-2n level transmitter may only be repaired by the manufacturer, GESTRA.
 - Only replace faulty equipment with identical equipment from GESTRA.
-

Checking function by initiating a test function

Check function by initiating the test function using the rotary knob, see Test table on page 42.

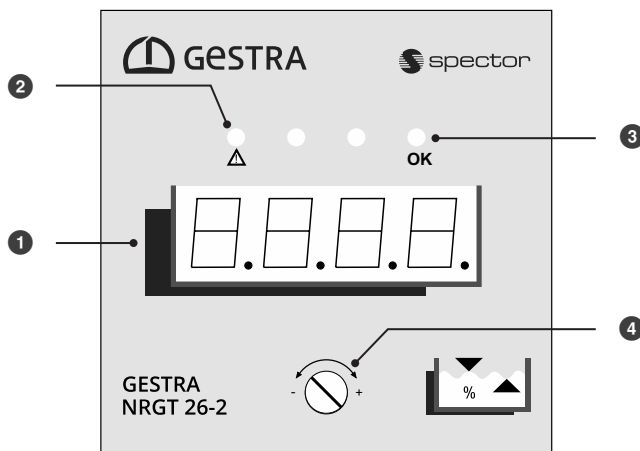


Fig. 16

Example NRGT 26-2n

The operating panel:

- ① Actual value display/error code/limit value, green, 4 digits
- ② LED 1, fault, red
- ③ LED 2, function OK, green
- ④ Rotary knob for operation and settings

Notes on the priority of the various indications



Fault indications are displayed based on their priority. Indications with higher priority are shown continuously before those with low priority. If several indications need attention, the display does not alternate between them.

Priority of error code display

Higher priority error codes overwrite lower ones on the display! See page 44 ff. for fault indications and the error code table.

Starting, operation and testing

Cross-reference of displays and LEDs and the operating state of the level transmitter:

Starting		
Switch on the supply voltage	All LEDs light up - Test Display: S-xx = software version t-08 = equipment type NRGT 26-2n	The system is started and tested. The LEDs and display are tested.

Normal operation		
The electrode rod is immersed within the set measuring range	Display: e.g. 047.3 LED 2: Operating LED lights up green	Displays the current level as % of the calibrated measuring range.

See the following pages for more information and tables.

Behaviour in the event of a malfunction (error code display)		
On the occurrence of a fault	Display: e.g. E005	An error code is permanently displayed, see error codes on page 44
	LED 1: Fault LED lights up red	There is an active fault
	LED 2: Operating LED is OFF	A fault is present
■ In the event of a fault or error state, an analogue value of 0 mA is displayed.		



Electrode faults cannot be acknowledged.

When a fault is corrected, the message disappears from the display, and the level transmitter returns to normal operation.

Starting, operation and testing



If password protection is enabled, you must enter the password before you can initiate the test function.

Test		
Checking function via simulation in operating mode		
In operating mode: Press the rotary knob on the NRGD 26-2n and hold until the end of the test: On each test, the equipment function toggles between levels 0% and 100%, and the actual value output delivers the corresponding signal, 4 mA or 20 mA.	Display: 0000 (%) or 0100 (%)	The test simulates water falling below the LW mark or rising above the HW mark. The simulated reading is displayed for each test.
	LED 2: Operating LED lights up green	Test function is active
	LED 1: Fault LED is OFF	No fault
	■ The current output can be simulated and tested ■ When the rotary knob is released, the test ends	



Faulty equipment is a risk to system availability.

- If the level transmitter does not behave as described above, the equipment may be faulty.
- Perform failure analysis.
- The NRGD 26-2n level transmitter may only be repaired by the manufacturer, GESTRA.
- Only replace faulty equipment with identical equipment from GESTRA.

System malfunctions

Causes

System malfunctions occur as the result of incorrect installation, overheating of equipment, radiated interference to the supply network, or faulty electronic components.

Check the installation and configuration before beginning systematic troubleshooting!

Installation:

- Check that the installation location complies with the admissible ambient conditions in terms of temperature, vibration, interference sources, minimum distances, etc.

Wiring:

- Does the wiring conform to the wiring diagrams?
- Does the 4-20 mA current loop have the correct polarity and is it closed?
- Is the 4-20 mA current loop below the overall output load of 500 Ω ?

ATTENTION



An open circuit in the 4-20 mA current loop can cause a system shutdown and a malfunction is indicated.

- Bring the system into a safe operating state before commencing work on the installation.
 - Switch off the voltage to the system and secure so that it cannot be switched back on.
 - Check that the system is not carrying live voltage before commencing work.
-

System malfunctions

Indication of system malfunctions using error codes

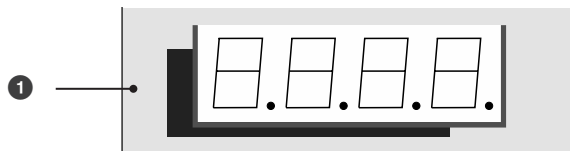


Fig. 17

1 Actual value display/error code/limit value, green, 4 digits

Error code display			
Error code	Internal designation	Possible errors	Remedy
E.001	MinCh1Err	Channel 1 reading below minimum, possible internal open circuit	Is the level electrode no longer immersed? Check installation location. Broken electrode rod? If necessary, replace the level transmitter
E.002	MinCh2Err	Channel 2 reading below minimum, possible internal open circuit	Is the level electrode no longer immersed? Check installation location. Broken electrode rod? If necessary, replace the level transmitter
E.003	MaxCh2Err	Channel 2 reading above maximum, possible internal short circuit	Damage to electrode rod PTFE (e.g. crack)? Replace the level transmitter
E.004	Ch1Ch2DiffErr	Difference between channels 1 and 2 exceeds 10% error tolerance, internal short circuit	Damage to electrode rod PTFE (e.g. crack)? Replace the level transmitter
E.005	MaxCh1Err	Channel 1 reading above maximum, possible internal short circuit	Damage to electrode rod PTFE (e.g. crack)? Replace the level transmitter
E.006	MinTSTCh1Err	Channel 1 reading internal capacitance (47pF)	Replace the level transmitter
E.007	MaxTSTCh1Err	Channel 1 reading reference capacitance (1nF 47pF)	Replace the level transmitter
E.008	MinTSTCh2Err	Channel 2 reading internal capacitance (47pF)	Replace the level transmitter
E.009	MaxTSTCh2Err	Channel 2 reading reference capacitance (1nF 47pF)	Replace the level transmitter
E.010	PWMTSTCh1Err	Channel 1 reading with disabled measurement signal	Replace the level transmitter
E.011	PWMTSTCh2Err	Channel 2 reading with disabled measurement signal	Replace the level transmitter
E.012	FreqErr	Measurement signal frequency	Replace the level transmitter

System malfunctions

Error code display			
Error code	Internal designation	Possible errors	Remedy
E.013	VMessErr (VMeas-Err)	4-20 mA analogue output error	Check wiring and output load. Is the connection connected or is the polarity reversed? Connect measuring equipment to M12 connector. If the error code disappears when measuring equipment is connected, check the on-site wiring.
E.014	ADSReadErr	16-bit AD converter is not responding	Replace the level transmitter
E.015	UnCalibErr	Factory calibration invalid (not measuring range calibration)	Replace the level transmitter
E.016	PlausErr	Measuring range plausibility error	Check measuring range calibration, repeat calibration if necessary
E.017	ENDRVErr	Second shutdown path of 4-20 mA analogue output faulty	Replace the level transmitter
E.019	V6Err	System voltage 6 V outside tolerance	Replace the level transmitter
E.020	V5Err	System voltage 5 V outside tolerance	Replace the level transmitter
E.021	V3Err	System voltage 3 V outside tolerance	Replace the level transmitter
E.022	V1Err	System voltage 1 V outside tolerance	Replace the level transmitter
E.023	V12Err	System voltage 12 V outside tolerance	Replace the level transmitter
E.025	ESMG1Err	µC error	Replace the level transmitter
E.026	BISTErr	µC periphery self-test error	Replace the level transmitter
E.027	OvertempErr	PCB temperature, ambient temperature > 75 °C	Check installation location. Lower the ambient temperature of the terminal box (cool if necessary)

All error codes E 018 to E 024 not listed here are available as reserves



Virtually all of the aforementioned error codes can be caused by EMC interference. This is less likely to be the case for permanent errors, but should be considered for sporadic error messages.

System malfunctions

Common application and usage errors

The 0% and 100% measuring range limits are obviously outside the sight glass level.

Possible causes if no error messages appear	Remedy
The measuring range is incorrectly set.	■ Check the measuring range calibration. ■ Repeat calibration if necessary.

The characteristic of the measurement signal in the measuring range is reproducible, but not linear.

Possible causes if no error messages appear	Remedy
The level electrode was installed without a protective tube. The protective tube is required as a counter electrode.	■ Install a protective tube.

The characteristic of the displayed reading appears implausible compared with the tendency of the level in the sight glass.

Possible causes if no error messages appear	Remedy
The pressure relief hole is clogged or flooded, or may even be missing completely.	■ Check the protective tube. ■ If necessary, add a pressure relief hole.
The stop valves of an externally mounted measuring cylinder (optional) are closed.	■ Inspect the stop valves, open if necessary.

A correctly set electrode that has been in operation for a long period delivers increasingly imprecise readings.

Possible causes if no error messages appear	Remedy
Increasing soiling due to build-up of deposits on the electrode rod.	■ Remove the level electrode and clean the electrode rod with a damp cloth.

A connected diagnostic tester indicates alarms, e.g. MIN or MAX, even though the level visible in the sight glass remains within the admissible measuring range limits.

Possible causes if no error messages appear	Remedy
■ The measuring range is incorrectly set. ■ There is soiling of the electrode or protective tube.	■ Calibrate the measuring range at the operating point. ■ Inspect the electrode and protective tube for soiling and clean if necessary.

System malfunctions

The display or control unit reacts to changes of level too slowly or too quickly.

Possible causes if no error messages appear	Remedy
The setting of damping coefficient "Filt" is not ideal.	Correct the damping coefficient "Filt".

The equipment fails to work. No display and the LEDs do not light up.

Possible causes if no error messages appear	Remedy
Supply voltage failure.	■ Switch on the supply voltage. ■ Check all electrical connections.

The equipment fails to work. The display is on and the LEDs light up.

Possible causes if no error messages appear	Remedy
The earth connection to the tank is interrupted.	■ Clean the sealing surfaces. ■ Screw in the NRG 26-2n level electrode with a metal sealing ring, see page 23.

Flashing values from t-71 to t-75 appear on the display

Possible causes	Remedy
The ambient temperature of the electrode terminal box is high, between 71 °C and 75 °C. If the temperature rises above 75 °C, the error code E.027 (Overtemp Err) appears and the 0 mA current output causes a fault shutoff.	■ Reduce the ambient temperature around the terminal box, e.g. by cooling.

System malfunctions

Checking installation and function

When you have remedied system malfunctions, perform a function test as follows.

- Check the level display by raising and lowering the fluid to different levels within the measuring range of the level electrode. Always perform this check with the system at its operating point.
- Also check that the level remains within the MIN and MAX limits when limit indicators are connected.
- Check the switchpoints when bringing into service and every time the NRGT 26-2n level transmitter is replaced.



System malfunctions of the NRGT 26-2n level transmitter result in an output of 0 mA at the analogue output.

If you require assistance, please tell us the indicated error code.



In the event of malfunctions or errors that cannot be remedied with the aid of this Installation & Operating Manual, please contact our service centre or authorised agent in your country.

Taking out of service

DANGER



Danger to life from scalding caused by escaping hot steam.

Hot steam or water can escape suddenly if the level electrode is unscrewed under pressure.

- Reduce the boiler pressure to 0 bar and check the pressure before unscrewing the level electrode.
- Only remove the level electrode at a **boiler pressure of 0 bar**.

WARNING



The hot level electrode can cause severe burns.

The level electrode becomes very hot during operation.

- Always let the level electrode cool down before performing installation and maintenance work.
- Only remove level electrodes that have cooled down.

Proceed as follows:

1. Reduce the boiler pressure to 0 bar.
2. Allow the level electrode to cool to room temperature.
3. Switch off the supply voltage.
4. Detach the plug-in connection.
5. Next, remove the level electrode.

Cleaning the measuring electrode of the level transmitter

Cleaning interval

We recommend cleaning the electrode at least once a year, such as during maintenance work, depending on the operating conditions.



Before cleaning the electrode rod, take the level transmitter out of service and remove it, see page 49.

Disposal

Dispose of the level transmitter in accordance with statutory waste disposal regulations.

Returning decontaminated equipment



If products have come into contact with media that are hazardous to health, they must be drained and decontaminated before being returned to GESTRA.

The term media can refer to solid, liquid or gaseous substances or mixtures, as well as radiation.

GESTRA can accept returned products only if accompanied by a completed and signed return note and also a completed and signed declaration of decontamination.



The return confirmation and declaration of decontamination must be attached to the outside of the return package, as processing will otherwise be impossible and the products will be returned to the sender at their expense.

Please proceed as follows:

1. Let GESTRA know about the return beforehand by e-mail or phone.
2. Wait until you have received the return confirmation from GESTRA.
3. Fill out the return confirmation (and declaration of decontamination) and send it with the products to GESTRA.

Declaration of Conformity Standards and Directives

You can find details on the conformity of the equipment and the applicable standards and directives in the Declaration of Conformity and the relevant certificates.

You can download the latest version of the Declaration of Conformity from www.gestra.com and request relevant certificates by writing to the following address:

GESTRA GmbH

Münchener Straße 77

28215 Bremen

Germany

Tel. +49 421 3503-0

Fax +49 421 3503-393

e-mail info@de.gestra.com

Website www.gestra.com

Modifications to the equipment not approved by us will invalidate the Declarations of Conformity and the certificates.



You can find our authorised agents around the world at:

www.gestra.com

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